

***Health Consultation***

**Phase I Hydrogeologic Investigation, Y Road Landfills  
Whatcom County, Washington**

August 31, 2000

Prepared by  
The Washington State Department of Health  
Under a Cooperative Agreement with the  
Agency for Toxic Substances and Disease Registry



## **Foreword**

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. The health consultation allows DOH to respond quickly to a request from concerned residents for health information on hazardous substances. It provides advice on specific public health issues. DOH evaluates sampling data collected from a hazardous waste site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health.

For additional information or questions regarding DOH, ATSDR or the contents of this health consultation, please call the Health Advisor who prepared this document:

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## **Glossary**

<b>Agency for Toxic Substances and Disease Registry (ATSDR)</b>	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
<b>Aquifer</b>	An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
<b>Carcinogen</b>	Any substance that can cause or contribute to the production of cancer.
<b>Comparison value</b>	A concentration of a chemical in soil, air or water that, if exceeded, requires further evaluation as a contaminant of potential health concern. The terms comparison value and screening level are often used synonymously.
<b>Contaminant</b>	Any chemical that exists in the environment or living organisms that is not normally found there.
<b>Exposure</b>	Contact with a chemical by swallowing, by breathing, or by direct contact (such as through the skin or eyes). Exposure may be short-term (acute) or long-term (chronic).
<b>Groundwater</b>	Water found underground that fills pores between materials such as sand, soil, or gravel. In aquifers, groundwater often occurs in quantities where it can be used for drinking water, irrigation, and other purposes.
<b>Indeterminate public health hazard</b>	Sites for which no conclusions about public health hazard can be made because data are lacking.
<b>Media</b>	Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.
<b>Monitoring wells</b>	Special wells drilled at locations on or off a hazardous waste site so water can be sampled at selected depths and studied to determine the movement of groundwater and the amount, distribution, and type of contaminant.
<b>Organic</b>	Compounds composed of carbon, including materials such as solvents, oils, and pesticides which are not easily dissolved in water.

<b>Plume</b>	An area of contaminants in a specific media such as groundwater.
<b>Risk</b>	The probability that something will cause injury, linked with the potential severity of that injury. Risk is usually indicated by how many extra cancers may appear in a group of people who are exposed to a particular substance at a given concentration, in a particular pathway, and for a specified period of time. For example, a 1%, or 1 in 100 risk indicates that for 100 people who may be exposed, 1 person may experience cancer as a result of the exposure.
<b>U.S. Environmental Protection Agency (EPA)</b>	Established in 1970 to bring together parts of various government agencies involved with the control of pollution.

## **Background and Statement of Issues**

The Washington State Department of Health (DOH) has prepared this health consultation in response to the review of the *Phase I Hydrogeologic Investigation, Y Road Landfills, Whatcom County, Washington* report, dated June 26, 2000. The Phase I report begins to address some of the community concerns about the potential effect of the closed landfills on nearby drinking water supplies.

The Y Road landfills, owned and formerly operated by Whatcom County, are located on two parcels within the Carpenter Creek drainage basin, northeast of the City of Bellingham (Figure 1). Carpenter Creek discharges to Lake Whatcom, the City of Bellingham's public water supply. Both landfills contain waste disposal areas that are covered with approximately one to two feet of soil. In general, five-acre rural residential properties that use private water supply wells as a drinking water source are located north, south, and west of the landfills. Surface water including springs located near the landfills may also be used as a drinking water source.<sup>1, 2</sup>

DOH prepared the first health consultation for the Y Road landfills in early 1999 at the request of several Whatcom County residents. These residents were concerned that people who use drinking water in the vicinity of the landfills or who obtain their drinking water from Lake Whatcom were being exposed to harmful levels of chemicals released from the landfills. Because limited information existed about the characteristics and quality of the groundwater and surface water systems in the vicinity of the landfills, DOH concluded that an indeterminate public health hazard existed. In response to this determination, DOH recommended that Whatcom County investigate the effect of the landfills on groundwater and surface water quality. Information obtained from the investigation would allow Whatcom County to evaluate whether the landfills posed a risk to human health.<sup>1</sup>

A second health consultation was prepared by DOH in mid-1999 in response to a request from Whatcom County Health and Human Services Department (Whatcom County Health) to review and comment on a draft request for an environmental assessment at the Y Road landfills. The draft request outlined proposed tasks for investigating environmental conditions including surface water and groundwater quality at and adjacent to the landfills. Although DOH concluded that the proposed tasks would significantly reduce the data gaps that had previously prevented the evaluation of the effect of the landfills on drinking water supplies, it did recommend some modifications to the proposal to allow a more complete evaluation to be conducted.<sup>2</sup>

Whatcom County completed the first phase of its environmental assessment at the Y Road landfills in early 2000. The findings from this phase of the assessment are presented in the Phase I report along with a proposed scope of work for the second phase of the hydrogeologic investigation. DOH's response to these findings and the proposed scope of work for the next phase of the investigation is presented below.

## **Discussion**

### *Phase I Investigation*

The Phase I report provides information about the geology and hydrogeology of the area surrounding the Y Road landfills. At least one shallow, perched aquifer and a deep, confined aquifer (the Squalicum Lake Valley Aquifer) were identified in the vicinity of the landfills. A 50 to 75-foot thick layer of relatively impermeable silt and clay (Bellingham Drift) reportedly separates the two aquifers.<sup>1,3</sup>

Groundwater in the shallow, perched aquifer(s) appears to flow toward and discharge to Carpenter and Olsen Creeks, which in turn discharge to Lake Whatcom. At least one domestic well, located within 2,000 feet of the landfills, reportedly obtains its water from the shallow, perched aquifer(s). A number of domestic wells obtain their water from the confined aquifer. Groundwater in the confined aquifer also reportedly flows toward Lake Whatcom.<sup>3</sup>

Information about the domestic wells located in the vicinity of the landfills was obtained from driller's logs on file with the Washington State Department of Ecology (Ecology) and Whatcom County Health. Relying on driller's logs, however, although a good first step in trying to identify wells in the vicinity of the landfills, provides only limited information about groundwater use in the area because the logs are not always complete and in some cases, are not submitted to the agencies. A door-to-door survey should be conducted to supplement information about domestic wells in the vicinity of the landfill.

One round of groundwater samples was collected from domestic wells located near the landfills as part of Whatcom County's preliminary evaluation of groundwater quality during the Phase I investigation. None of the sampled domestic wells, however, were located in the shallow perched aquifer(s).

Groundwater samples were collected from two domestic wells located west of the younger of the two landfills (Figure 2). These wells were reportedly screened in the confined aquifer. The confined aquifer, which is overlain by the relatively impermeable Bellingham Drift, is the primary, drinking water source for residents living near the landfills.<sup>3</sup> Two additional wells were also sampled during the Phase I investigation. It was assumed by Whatcom County that these wells were also screened in the confined aquifer. However, there was no information available in the report to support this conclusion. All of the groundwater samples collected during the Phase I investigation were analyzed for volatile and semi-volatile organic compounds, pesticides, herbicides, polychlorinated biphenyls (PCBs), dissolved metals, and conventional water quality parameters such as nitrates, ammonia, sulfates, chlorides, and pH.

Although no groundwater samples were collected from the shallow perched aquifer(s), the Phase I report does suggest that there is a high risk to the aquifer(s) because the landfills are situated above and in some locations, possibly within the aquifer(s). The

report also suggests that the relatively impermeable, silt and clay located above the deeper, confined aquifer reduces the risk posed by the landfills and suggests that no significant evidence of leachate impacts exists for the confined aquifer based on the one round of sampling results.<sup>3</sup>

DOH concurs that the landfills pose a high risk to the shallow aquifer(s). However, some problems with sampling and/or analytical procedures and laboratory reporting limits used during the Phase I investigation were noted by DOH which limits the use of the data for making a determination about the effect of the landfill on the confined aquifer.

For example, the reporting limit for vinyl chloride, a carcinogen and a common landfill contaminant that is often detected in soil gas and groundwater near landfills, exceeds the ATSDR drinking water comparison values. ATSDR comparison values are media-specific concentrations that are used to select environmental contaminants for further evaluation of potential human health effects.<sup>4</sup> Reporting limits for benzene, dieldren, chlordane, PCBs, benzo(a)pyrene, and other analyzed contaminants also exceed ATSDR drinking water comparison values. Because of the problems with the reporting limits, DOH cannot estimate the potential health hazard posed by the groundwater.

Filtered and unfiltered samples were collected from the domestic wells for metals analysis during the Phase I investigation. The filtered groundwater results for metals, however, often exceeded the corresponding unfiltered sample results. This suggests a potential problem with the sampling and/or analysis. As a result, DOH cannot estimate the potential human health hazard posed by the metals in the confined aquifer.

Filtered groundwater samples are generally not considered representative of groundwater used as a drinking water source. The filtered results reported for the groundwater samples collected during the Phase I investigation, therefore, may be lower than the concentrations to which the residents are exposed.

Carpenter and Olsen Creeks are potential sources of drinking water and may also serve as habitat for various types of edible fish. However these exposure pathways were not considered during the Phase I investigation. DOH attempted to evaluate these pathways. However, sampling and laboratory problems similar to those identified for groundwater also exist for surface water samples collected during the Phase I investigation.

### *Phase II Proposed Statement of Work*

Recommendations for a Phase II investigation are presented in the Phase I report. The purpose of the Phase II investigation is to evaluate the physical characteristics of the landfill including delineation of the waste boundaries and evaluation of the landfill cover materials; characterize the nature and extent of contamination in the upper perched aquifer at each landfill; and evaluate surface water quality.<sup>3</sup>

According to the proposed statement of work, geoprobes will be installed in the shallow, perched aquifer(s) at each landfill during the Phase II investigation. Samples will be collected from each geoprobe and analyzed for a limited suite of parameters in an attempt to identify any leachate plumes in the shallow aquifer(s). Information about the location of leachate plumes will be used to install groundwater monitoring wells in the shallow, perched aquifer(s).<sup>3</sup> The proposed scope of work, however, suggests that groundwater monitoring wells will only be installed in the shallow, perched aquifer(s) if contaminant plumes are detected during the geoprobe groundwater sampling.

A one-time sampling event with geoprobes and a limited suite of analytical parameters is a good screening tool. However, it is inadequate for demonstrating that groundwater near the landfill is not contaminated. A monitoring well network sampled over an extended period of time and analyzed for appropriate chemicals, using appropriate sample collection devices, is necessary for evaluating the potential effect of the landfill on the nearby drinking water supplies.

The proposed sampling and analysis of groundwater and surface water for the Phase II investigation appears similar to the sampling and analysis conducted during Phase I. investigation. DOH's earlier discussion about the problems associated with groundwater and surface water sampling during the Phase I investigation should be considered when conducting the Phase II investigation. In addition, the groundwater sampling pumps proposed for the Phase II investigation may cause sample degassing and loss of the volatile components and should be replaced with appropriate sampling devices.

## **Chemical Exposure and Children**

Children can be uniquely vulnerable to the hazardous effects of many environmental contaminants. When compared to adults, pound for pound of body weight, children drink more water, eat more food, and breathe more air. Children have a tendency to play closer to the ground and often put their fingers in their mouths. These facts lead to an increased exposure to contaminants in various environmental media. Additionally, before birth, the fetus is highly sensitive to many chemicals that may cause organ malformations and even premature death. For these reasons, it is very important to consider the specific impacts that contaminants may have on children, as well as other sensitive populations.



The Y Road landfills are located in a rural, residential area where children potentially could be exposed to landfill contaminants through the groundwater and surface water pathways. No other sensitive populations have been reported.

## **Conclusions**

1. The Phase I hydrogeologic investigation provides limited information about the effect of the landfill on nearby drinking water supplies. No groundwater samples were collected from the shallow, perched aquifer. Limited sampling was conducted in the confined aquifer, which is the primary drinking water source in the vicinity of the Y Road landfills. Limited surface water sampling was also conducted.
2. An indeterminate human health risk exists for the confined aquifer because of the limitations associated with the groundwater data collected during the Phase I hydrogeologic investigation.
3. An indeterminate human health risk exists for Carpenter Creek because of the limitations associated with the surface water data collected during the Phase I hydrogeologic investigation.
4. The proposed Phase II investigation will need to be modified and expanded to evaluate effect of the landfill on human health.

## **Recommendations/Public Health Action Plan**

1. Prior to any future water quality sampling and analysis, analytical reporting limits should be evaluated to ensure that they do not exceed appropriate human health, water quality comparison values.
2. Unfiltered groundwater sample results should be evaluated to determine the potential human health effects associated with metals in the shallow, perched aquifer and the deeper, confined aquifer.
3. Appropriate sampling and analytical procedures should be used for surface water samples collected near the landfills so the potential human health effects associated with exposure to the surface water can be evaluated.
4. Humans may potentially be exposed to surface water contaminants through ingestion, dermal contact, and inhalation or through ingestion of fish or shellfish that may be exposed to

contaminants. Appropriate surface water exposure pathways should be identified during the hydrogeologic investigation at the landfills.

5. A door-to-door survey should be conducted in the vicinity of the landfills to ensure that all domestic and irrigation wells have been identified and all available information about well construction is obtained.
6. The pumps proposed for groundwater sampling during the Phase II investigation may cause sample degassing and loss of volatile constituents. This could result in inaccurate estimates of groundwater contaminant concentrations and underestimate the risk posed by the groundwater. Groundwater sampling guidance prepared by EPA and others should be reviewed to select appropriate groundwater sampling devices.
7. A monitoring well network should be installed in the shallow, perched aquifer during the Phase II hydrogeologic investigation at the Y Road landfills. Four quarterly rounds of groundwater samples should be collected for one year to evaluate contaminant concentrations in the shallow, perched aquifer. Decisions regarding subsequent groundwater sampling events should be based on the initial four sampling rounds.
8. Surface water samples should be collected and analyzed at Olsen Creek, a potential human exposure pathway, if it is located hydraulically downgradient of the landfill.
9. Future plans and reports prepared for the Y Road landfills should be submitted to DOH for review.

## **References**

1. Health Consultation, Y Road Landfill (1 of 2), Northeast of Bellingham, Whatcom County, Washington, Washington State Department of Health, March 13, 2000.
2. Health Consultation, Y Road Landfill (2 of 2), Northeast of Bellingham, Whatcom County, Washington, Washington State Department of Health, March 13, 2000.
3. Phase I Hydrogeologic Investigation, Y Road Landfills, Whatcom County, Washington, BEK Engineering & Environmental, June 26, 2000.
4. ATSDR, Drinking Water Comparison Value (Expire September 30, 2000).

## **Certification**

This Phase I Hydrogeologic Investigation, Y Road Landfills Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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